The Fifties

New Leadership

Herbert F. York
(1952•1958)

Edward Teller
(1958•1960)

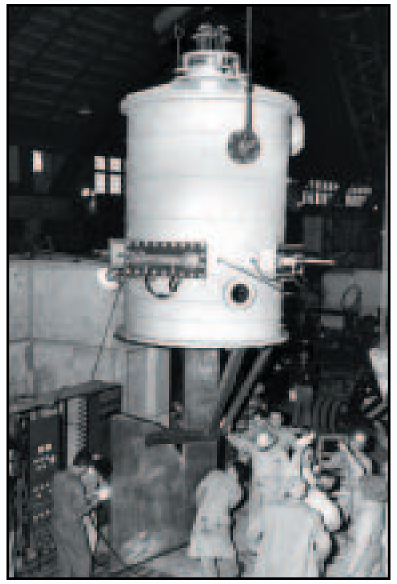
The Cold War was raging, and on August 29, 1949, the Soviet Union detonated its first atomic bomb—much sooner than expected by Western experts. Less than a year later, Communist North Korean forces crossed the 38th parallel to invade the Republic of Korea. National security was at stake. The urgent need to accelerate the nation's H-bomb program led

A "new ideas" laboratory

Ernest O. Lawrence and Edward Teller to argue for the creation of a second laboratory to augment the efforts of Los Alamos. On September 2, 1952, a branch of the University of California's Radiation Laboratory opened in Livermore, California.

Livermore's first director, Herbert F. York, and a remarkable group of young scientists set out to be a "new ideas" laboratory. They were committed to pursuing innovative solutions to the nation's pressing needs to advance nuclear weapons science and technology. The Laboratory's first nuclear experiments were failures. But later in the decade, Livermore scientists made a major breakthrough—the design of a megaton-class warhead for ballistic missiles that could be launched from submarines.

When the Laboratory opened in 1952, the old Navy infirmary (above) served as the administration building, and it housed Livermore's first computer.



Two of the Laboratory's first major facilities for nuclear research were the 90-inch cyclotron (far left), which operated from 1954 to 1971, and the Livermore Pool-Type Reactor (left), which was used for experiments from 1957 to 1980.

Team Science in the National Interest

The Livermore branch of the University of California Radiation Laboratory (UCRL) at Berkeley opened for operation on September 2, 1952, at a deactivated Naval Air Station. The infirmary at the old air station had been used by a group of UCRL physicists to help Los Alamos with diagnostics for the George thermonuclear test fielded at Eniwetok Atoll (Central Pacific) in May 1951. The site also was being used by California Research and Development, a subsidiary of Standard Oil, to build the Materials Testing Accelerator (MTA), a pilot for a larger accelerator to produce tritium and plutonium for weapons. Conceived by Ernest O. Lawrence, founder of UCRL, the MTA project was abandoned in 1954 after the discovery of large domestic deposits of uranium ore, and the "Rad Lab" took sole possession of the square-mile site.

Working conditions at the Rad Lab were primitive, with the staff housed in old wooden buildings with poor heating and no air conditioning. Initially, there were fewer telephones than promised, no post office box for mail delivery, and, according to the minutes of an early administrative meeting, "The desk lamp situation is very bad." The infirmary building was in the best shape, so Herbert F. York, the first director, and an opening-day staff of 75 located there. York's office was in the x-ray room—it was lead shielded, and he could carry on classified discussions without being overheard.

Establishment of the Laboratory was triggered by the detonation of the first Russian atom bomb in 1949, which alarmed some American scientists who feared a quick Soviet advance to the next step, the hydrogen bomb. Edward Teller and Lawrence, both very concerned, met on October 7, 1949, at Los Alamos to discuss the crisis. The ensuing actions taken by key figures in Washington led to the creation of the Livermore Laboratory to more rapidly advance nuclear weapons science and technology. Activities began with a sketchy mission statement and a commitment by York and his team to be a "new ideas" laboratory.

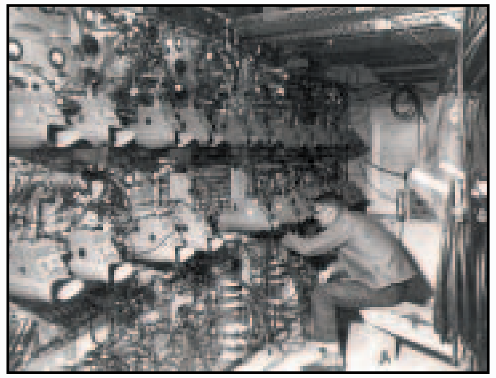
York, then 32 years old, was singled out by Lawrence to head the new laboratory. He had co-led the team that worked on diagnostics for the George event. York faced two principal challenges: planning the Laboratory's research program and recruiting the first employees. His plan had four main elements: development of diagnostics for weapons experiments (for both Los Alamos and Livermore), the design of thermonuclear weapons, Project Sherwood (a magnetic fusion energy program), and a basic physics program. Staff recruitment relied heavily on connections with Berkeley. By the end of 1952, the staff had grown to 300, by the end of the first year of operation to 1,000, and within just five years to 3,100.

Following the lead of his mentor, York established a matrix organization for the Laboratory, a distinguishing feature of Livermore still in use today. In this approach, experts in various relevant disciplines assemble as a team and work together to understand and solve complex problems. This way of structuring and organizing research and development enables the Laboratory to better reach its mission-directed technological goals. And the rest is history.

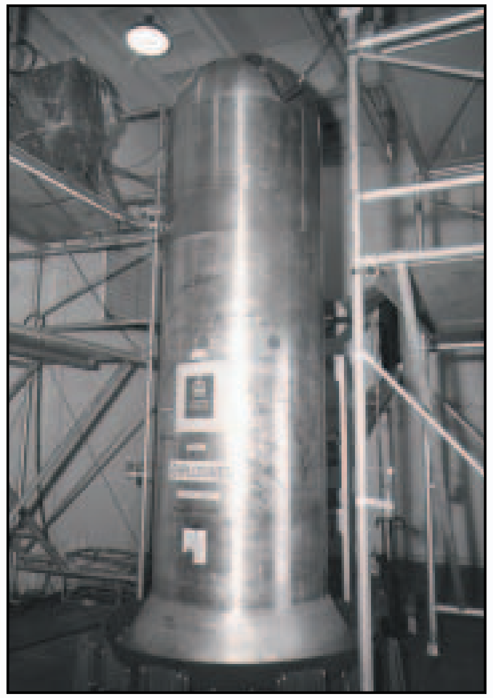
Livermore's first director, Herbert F. York (right), confers with founders Ernest O. Lawrence (left) and Edward Teller (center).

1953 Ruth

The remains of the Ruth test tower after the first device fielded by the Laboratory was detonated in 1953. The test failed.



Banks of oscilloscopes are used to capture data at the Nevada Test Site during Operation Teapot in 1955.



Shown in position inside a barge, one of the Laboratory's largest designs, the Tewa device, yielded five megatons when it was detonated near Bikini Atoll in 1956.

Pushing the Frontiers of Nuclear Weapon Design

Ruth, the Laboratory's first nuclear test, explored a new design for fission devices that offered hope for smaller, more efficient bombs and provided information about certain thermonuclear reactions. The experiment, and the test that followed (named Ray), exemplified Livermore's commitment to be a "new ideas" laboratory and, in the words of Edward Teller, to "plan and explore all kinds of new developments in the field of bomb physics."

The device was mounted on a 300-foot steel tower, and Ruth was fired on March 31, 1953—just six months after Livermore opened. The test was a fizzle. More than half of the tower remained standing afterward. Fired on April 11, 1953, Ray also was a fizzle, although legend has it that Ray was mounted on a shorter 100-foot tower to ensure its complete destruction. But the Laboratory pressed ahead in its quest for more compact weapon designs that were efficient in their use of nuclear materials.

Livermore's interest in novel small fission weapon designs would come to fruition in the 1950s, in part because of Los Alamos's attention to meeting the Air Force's needs for large H-bombs. The Army was interested in atomic projectiles between 8 and 11 inches in diameter, and the Air Force envisioned the need for nuclear-tipped antiaircraft missiles. Livermore's main thrust in this area was a new design concept that combined disparate elements from previous fission weapon designs. Ideas matured for fission weapons with a smaller diameter, requiring less nuclear materials and/or an increased yield to weight.

This research led to some of the Laboratory's first weapon-development assignments, including the W45 for the Little John and Terrier tactical missile systems and the W48 155-millimeter howitzer atomic projectile. A strong continuing interest in improved designs for tactical systems culminated in the Laboratory's work on the W79 enhanced-radiation artillery shell in the 1970s (see Year 1975).

The role of Livermore as the "new ideas" laboratory also guided the decision to focus thermonuclear work on the design of small H-bombs. As early as the Castle test series in 1954, Livermore investigated H-bomb designs smaller in size and yield than those designed by Los Alamos. The first thermonuclear test, Koon, also was a fizzle, yielding only 100 kilotons of an expected 1 megaton. Continuing efforts and future successes led to Livermore's development of much smaller diameter H-bomb missile warheads later in the 1950s, which made the Polaris submarine program possible (see Year 1956).

An Eyewitness Account of Ruth

Wally Decker, who later headed the Mechanical Engineering Department and finished his long career on the Director's Office staff, was a young engineer when he witnessed Ruth. According to Decker, "We got everything ready. We stood back with our dark glasses on, waiting for the device to go off. When it was fired, all we could see was a small speck of light on the horizon—no mushroom cloud, no nothing.

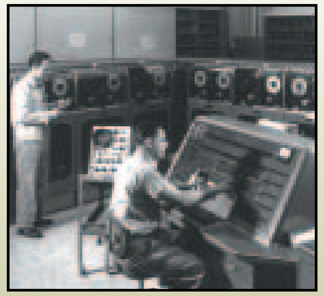
"But we didn't give up. We prepared for another event with a slightly different design. And when we fired the device, it was dismal, too.

"After those failures, our fortunes were at low ebb. We always said that we got a lot of good information from those failures—and we did—but you don't always get to stay around to play your best game. Fortunately, we did, and things got better for the Lab."

1954 THE IBM 701

The IBM 701 computer was delivered to the Lab in 1954—it was 12 times faster than its predecessor, the Univac-1.

The Origin of FORTRAN



The Univac-1 was a simple computer to program in machine language; however, the IBM 701 was more difficult to use—one reason was its reliance on punch cards for input and output. Programmers in companies and laboratories that owned 701s talked among themselves informally, and various "home-brewed" systems resulted. IBM soon began to develop a higher-level language, FORTRAN (formula translation), and the Laboratory sent Robert Hughes to IBM for an extended visit to contribute to the effort. The original FORTRAN manual lists four contributors, one of them Robert Hughes.

Speed Is the Game

With delivery of the IBM 701 in 1954, the Laboratory dramatically improved its capability to perform scientific calculations. With 72 cathode-ray tubes, 2,048 words of memory, and accompanying gadgetry, the machine was the first commercially successful "scientific" supercomputer because of its speed. It was 12 times faster than its predecessor, the Univac-1, which the Laboratory acquired during its first year of operation. The Univac-1 correctly predicted the Eisenhower landslide victory in the 1952 presidential election with only 7 percent of the vote tallied, but Livermore's needs quickly outgrew the machine's capabilities.

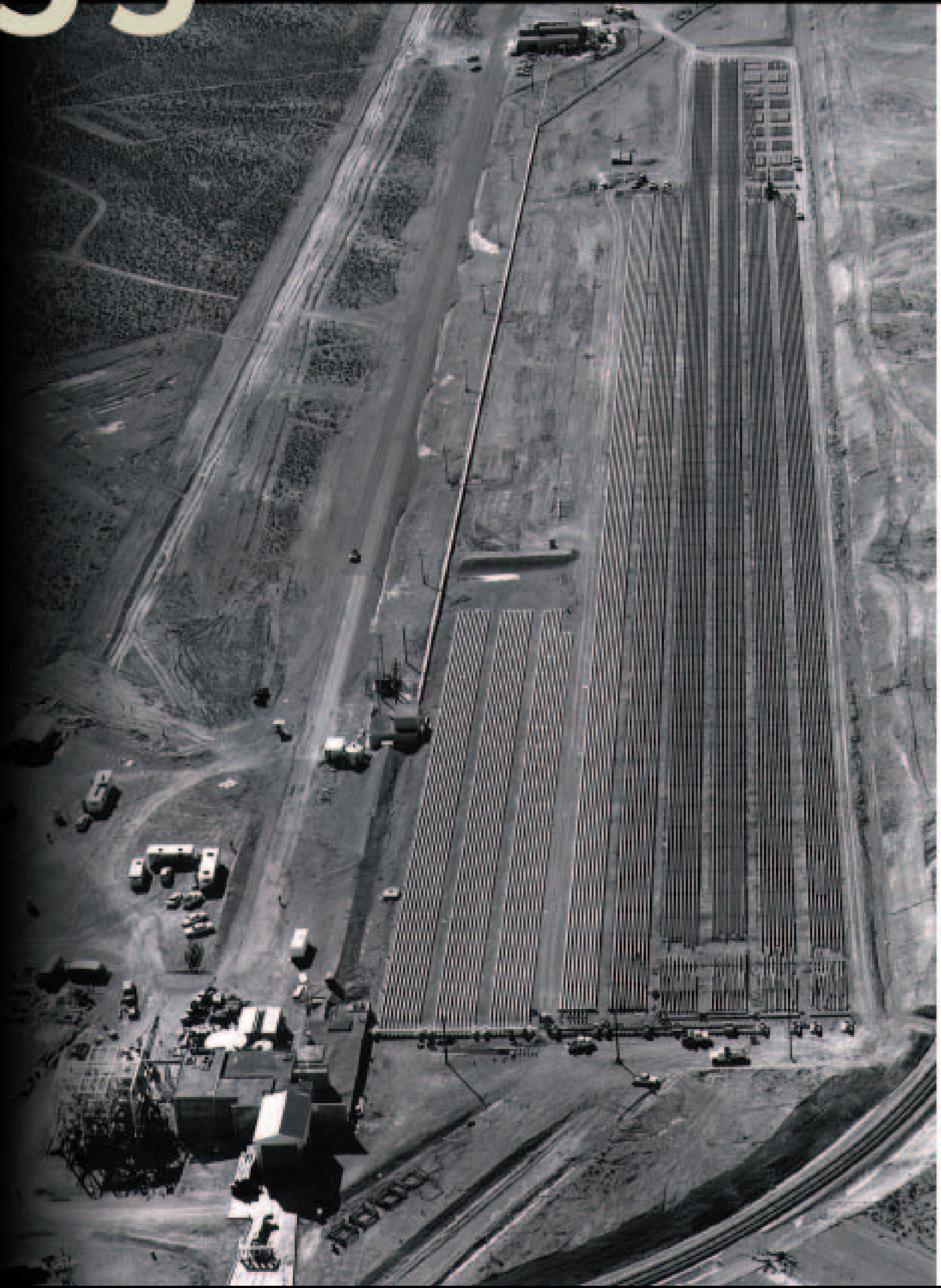
Even before the Laboratory was a reality, founders Ernest Lawrence, Edward Teller, and Herb York understood the need for mammoth amounts of computing power. Almost from the opening of the doors in 1952, a sizable team of Livermore people was learning to use the Univac-1 and troubleshoot its problems. At election time, the machine earmarked for Livermore was loaned to a TV network to predict the results. Acquisition of the Univac-1, and soon after the IBM 701, marked the beginning of the Lab's not-so-coincidental links to commercial supercomputing—their nearly identical birth dates, efforts to develop the fastest and most powerful machines, and use of machines to solve large, complex problems.

The IBM 701 and all of Livermore's supercomputers since have been developed in part at the Laboratory's encouragement. The IBM 701 was the last vacuum-tube model before magnetic core and transistor memory. With the change in technology to transistors, computer speed and storage capacity have rapidly advanced in accordance with a phenomenon dubbed "Moore's Law," formulated in 1965 by Gordon Moore, founder of Intel Corporation. The law has accurately predicted that every 18 months technology advances would allow a doubling of the number of transistors that could be put on a computer chip. Ongoing work at the Laboratory on extreme ultraviolet lithography (see Year 1999) aims to extend Moore's Law to approximately 2010.

Livermore is also part of the National Nuclear Security Administration's Advanced Simulation and Computing (ASCI) program, which was initiated in 1995 to increase supercomputer speed and capacity faster than afforded by Moore's Law. In the ASCI supercomputers, thousands of the most powerful microprocessors industry produces are configured to work in parallel. The IBM ASCI White machine at Livermore, the world's most powerful computer in 2002, consists of 8,192 processors and is able to perform 12 trillion operations per second (12 teraops)—30 billion times faster than the Univac-1 (see Year 2000).

Livermore's terascale computing capabilities keep the Laboratory at the forefront of scientific computing in the early 21st century. They promise to help experts maintain the nation's nuclear deterrent and open many new avenues of scientific discovery.

Delivered in May 1960, the building-size LARC (Livermore Advanced Research Computer) was built by Remington-Rand to specifications provided by the Laboratory.



Construction is shown in progress to expand the "tank farm" that supplied high-pressure air to the ramjet reactor, which was tested inside a special facility (lower left in the photo). In one experiment, Tory II-C (far right photo) required hundreds of tons of heated air to operate for nearly five minutes.

Flying and Terrestrial Nuclear Reactors

In 1955, the Laboratory and Los Alamos began work on Rover, a project intended to supply nuclear propulsion for space travel. The nuclear rocket program continued for many years at Los Alamos with many technical successes, while Livermore's attention shifted in 1957 to a new flying reactor effort, Project Pluto, for the Atomic Energy Commission and the Air Force. An awesome undertaking, Project Pluto entailed the design and testing of a nuclear ramjet engine for low-flying, supersonic cruise missiles that could stay aloft for many hours.

For Project Pluto, Livermore designed and built two Tory II-A test reactors to demonstrate feasibility, and Tory II-C was designed as a flight-engine prototype. Laboratory experts in chemistry and materials science were challenged to devise ceramic fuel elements that had the required neutronics properties for the reactor yet were structurally strong and resistant to moisture and oxidation at high temperatures. Because the reactors needed hundreds of thousands of the elements, they also had to be mass producible. Testing the reactors required novel remote-handling technologies, as well as systems capable of ramming about a ton of heated air through the reactor each second.

For 45 seconds on May 14, 1961, Livermore tested the Tory II-A at the Nevada Test Site. After additional successful experiments in 1961, Tory II-C was designed and built. Generating 500 megawatts of power (about half the power capacity of Hoover Dam), it was successfully tested in the spring of 1964. All six tests of the two Tory reactors were conducted without failure. However, that summer, the project was halted for lack of a firm military commitment.

Laboratory expertise in reactors and the nuclear fuel cycle has continued to find many applications. The year Project Pluto ended, Super Kukla began operation in a shielded bunker at the Nevada Test Site. Super Kukla was a prompt-burst neutron-pulse reactor designed to serve as a neutron source for irradiating a variety of test specimens, including fissile material used in weapon components. Experiments using the reactor helped to assure that U.S. nuclear warheads would function in wartime environments. In addition, from 1957 to 1980, the Livermore Pool-Type Reactor (a megawatt-class reactor) was operated onsite for neutron radiography, fundamental research on radiation damage to materials, and the detection of trace quantities of materials through neutron activation.

Today, Laboratory expertise in fission energy serves the Department of Energy, the Nuclear Regulatory Commission, and other government agencies through more than 80 projects. These efforts apply Livermore's advanced science and engineering capabilities to the protection of public health and safety and to the advancement of technology in fission energy and the nuclear fuel cycle (for example, the Yucca Mountain Project, discussed in Year 1980). Projects include technical support and services in areas such as risk and hazard analysis; structural and thermal analysis; containment, shielding, and criticality analysis; accident analysis; environmental assessments; radiation protection; and quality assurance.

1956 POLARIS

The Laboratory's design for the W47 Polaris warhead made it practical for U.S. nuclear deterrent forces to be deployed from highly survivable submarines.

A Strategic Breakthrough

In the summer of 1956, a Navy-sponsored study on antisubmarine warfare was held at Nobska Point in Woods Hole, Massachusetts. Edward Teller attended the Project Nobska study. His bold input would profoundly affect the course of the Navy's Fleet Ballistic Missile Program and the future of the Laboratory. At the time, the approved program plans called for the deployment in 1965 of submarines that would carry horizontally four 80-ton Jupiter S ballistic missiles, which were large enough to carry existing thermonuclear warheads.

During Project Nobska, Frank E. Bothwell from the Naval Ordnance Test Station raised the possibility of designing ballistic missiles 5 to 10 times lighter than the Jupiter S missiles, with a range of 1,000 to 1,500 miles; however, they would be able to carry only a relatively low-yield nuclear weapon. Teller discussed the feasibility of a 1-megaton warhead compact enough to fit onto a torpedo—a radical concept. When asked whether his ideas could be applied to the Navy ballistic missile program, Teller replied with a question, "Why use a 1958 warhead in a 1965 weapon system?" He opened the door to a highly efficient deterrent system in which 16 compact missiles could be placed vertically on a submarine and launched on demand without repositioning—the Polaris program.

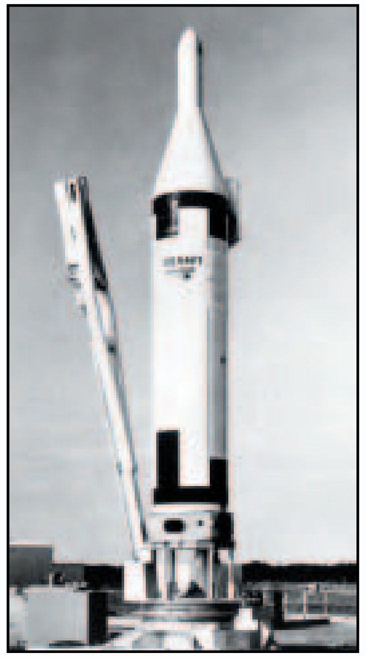
So began a crash, three-year effort. In early 1957, the Navy issued a requirement for an underwater-launched solid-fuel missile system by 1965. By the end of the year, following successful tests of Livermore designs at the Nevada Test Site, the Secretary of Defense authorized a step-up to deploy the system by 1960, which was accomplished.

The summer of 1958 brought genuine breakthroughs based on ingenious proposals by Carl Haussmann, Kenneth Bandtel, Jack Rosengren, Peter Moulthrop, and David Hall of A Division and by B Division's John Foster (Lab Director, 1961–1965), Chuck Godfrey, and Wally Birnbaum. The significance of the innovations was confirmed during tests in the Pacific only a few months before the 1958–1961 nuclear testing moratorium began. Work continued at the Livermore and Sandia laboratories, and through the efforts of weapons designers and engineers, computer specialists, and other experts, the W47 Polaris warhead was created.

The program's remarkable achievements were demonstrated in spectacular fashion on May 6, 1962. The USS *Ethan Allen*, the sixth-launched Polaris submarine, fired a complete operational test of the Polaris A-1 missile system, culminating with the successful detonation of the Livermore-designed megaton-class warhead (see Year 1962).

Conceived as a highly survivable system able to counterattack in the event of a Soviet first strike, Polaris has a unique place in American nuclear weapons history. The Laboratory's innovative design and development of the W47 as part of a crash program established Livermore's reputation as a major nuclear weapons design facility. The work spurred additional innovations and provided a model for future strategic weapon development.

The Polaris flag was presented by the Navy to Livermore scientists and engineers for the Laboratory's outstanding work in the development of the Polaris missile warhead.



Teller Recalling Project Nobska

"The Navy asked if we could make a nuclear explosive of such and such dimensions and such and such a yield. What they wanted was a small, light, nuclear warhead in the 1-megaton range. Everyone at the meeting, including representatives from Los Alamos, said it could not be done—at least in the near future. But I stood up and said, 'We at Livermore can deliver it in five years and it will yield 1 megaton.' On the one hand, the Navy went away happy, and the program got approved. On the other hand, when I came back to Livermore and told them of the work that was in store for them, people's hair stood on end. They said, 'What have you done? We can't get a megaton out of such a small device, not in five years!'"

Radiation detection equipment in the foreground monitors the environment for a worker in a tunnel at the Nevada Test Site that was dug for the Rainier event in 1957.

Radiochemical analysis of the isotopes created by a nuclear explosion was an important diagnostic tool for determining the yield and studying the performance of tested devices. Major advances in radiochemistry were made by Peter Stevenson (second from the right), who was killed in a plane crash returning from the Nevada Test Site in 1979.

The First Underground Nuclear Test

On September 19, 1957, the Laboratory detonated the first contained underground nuclear explosion. Rainier was fired beneath a high mesa at the northwest corner of the Nevada Test Site, which later became known as Rainier Mesa.

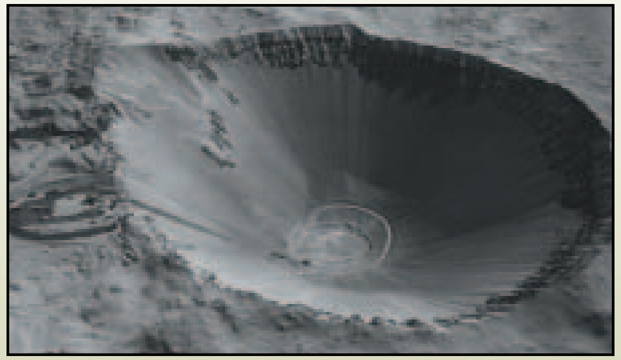
Carrying out such an explosion had been proposed early in 1956 by Dave Griggs, a geophysicist who greatly contributed to Edward Teller's effort to establish a second nuclear laboratory while serving as Chief Scientist of the Air Force in the early 1950s, and by Teller. Their interest was in the coupling of the explosion energy to the surrounding geology and in the seismic effects. They also noted the environmental advantages of such a test at a time when there was growing concern about atmospheric nuclear testing. Rainier would prove to be a pivotal event by giving a boost to the nascent Plowshare Program and affecting the future of nuclear arms control and the conduct of nuclear tests.

The idea of using nuclear explosions for non-military uses—beating swords into plowshares—preceded the Rainier event. In the summer of 1956, Harold Brown (Lab Director 1960–1961) proposed a symposium on the subject to the Atomic Energy Commission (AEC), and it was eventually held at Livermore in February 1957. Some 24 papers were presented covering a broad array of ideas. Although the discussions were hampered by the lack of actual data on the effects of underground explosions, interest was high. In June, the AEC established the Plowshare Program to explore peaceful nuclear uses, such as the building of canals and dams, and the stimulation of natural gas reservoirs. Subsequently, the Rainier test and its data gave a tremendous boost in confidence that a variety of applications were possible and could be implemented safely.

The Rainier event was announced in advance so that seismic stations throughout the U.S. and Canada could attempt to record a signal. In addition, samples were collected for radiochemistry analysis by drilling a series of holes from the mesa above and in the original tunnel. More data was collected by mining a tunnel into the bottom of the explosion cavity about 15 months later when radioactivity had decayed to manageable levels. From these post-shot investigations, scientists were able to develop the understanding of underground explosion phenomenology that persists essentially unaltered today. That information provided a basis for subsequent decisions in 1963 to agree to the Limited Test Ban Treaty, which banned atmospheric nuclear weapons tests and led to systems being established for monitoring nuclear test activities worldwide, including an international array of seismic detectors.

The Legacies of Plowshare

The first Plowshare test, Gnome, created an underground cavity about 70 feet high and 165 feet in diameter in a dry salt bed near Carlsbad, New Mexico. Many potential applications were explored until the program ended in 1977, and they drove nuclear design to the two extremes—minimum fission or minimum fusion depending on the application. The most dramatic relic of Plowshare is a 350-foot-deep, 1,200-foot-diameter crater (right) at the Nevada Test Site created by the Sedan event in 1962. Important legacies of the effort include Livermore's biomedical research program to study the effects of fallout and other radioactive hazards on biological systems (see Year 1963) and the



Laboratory's Atmospheric Release and Advisory Capability (ARAC) program, which grew out of the need to predict the potential for atmospheric release from cratering shots (see Year 1979).


Photo credit: Ernest Orlando Lawrence Berkeley National Laboratory

Premier Khrushchev delivers a speech during the reception in the Kremlin's Georgian Hall following the formal signing of the Limited Test Ban Treaty on August 5, 1963. Hoping he would not be caught taking this picture, University of California Professor Glenn T. Seaborg, who was then Chairman of the Atomic Energy Commission, captured an image of the event.

The Evolution of Nuclear Force Postures

Michael May's distinguished career included many contributions to the evolution of U.S. strategic forces. May, a Laboratory Director from 1965 to 1971, served as Technical Adviser to the Threshold Test Ban Treaty negotiations (1974) and as U.S. Delegate to the Strategic Arms Limitation Talks (SALT) with the Soviet Union (1974–1976). Although never ratified, the SALT II Treaty effectively capped the growth of strategic nuclear arsenals during the Cold War. In 1981, May participated in a panel chaired by Berkeley Professor Charles Townes that recommended to President Reagan how to base MX (Peacekeeper) missiles, and in 1988, he was lead author of "Strategic Arms Reductions" in *International Security*, a seminal paper that provided an intellectual basis for subsequent Strategic Arms Reduction Treaty force reductions. Serving as a member of the National Academy of Sciences Committee on International Security and Arms Control, May also directed a study that resulted in the 1991 report *The Future of the U.S.–Soviet Nuclear Relationship*, which paved the way for later decisions about post–Cold War nuclear policy and strategic force reductions.

Providing Technical Support for Arms Negotiations

In July and August 1958, Ernest O. Lawrence and Harold Brown (Lab Director, 1960–1961) attended the Conference of Experts held in Geneva, Switzerland, to examine how a comprehensive ban on nuclear testing could be verified. Their participation signaled the beginning of the Laboratory's long history of providing technical support for arms control negotiations and implementation. Lawrence served as one of the three U.S. representatives at the conference, and Brown was a member of the delegation's technical advisory group. At the conference, Lawrence performed his final service to the nation before suffering an acute attack of colitis that led to his death. Many Livermore scientists would follow in Lawrence's and Brown's footsteps by contributing their expertise to the negotiations of nuclear arms reduction and nuclear test ban treaties.

The Conference of Experts' report exposed the technical challenges involved in detecting and identifying nuclear explosions. The report was surprisingly accurate considering that the Rainier event had been the only underground nuclear test of significant yield (see Year 1957) and no nuclear explosions had occurred at high altitude or in space. The report also defined the technical equipment of the control system needed to detect and identify nuclear explosions.

At the conclusion of the Conference of Experts, President Eisenhower announced U.S. willingness to suspend nuclear weapons testing and begin negotiations on a comprehensive test ban. Concurrent with these negotiations, a feasible verification regime was to be developed. Research on monitoring nuclear explosions ensued at the Laboratory as part of the Vela program. The seismic detection of underground explosions (Vela Uniform) proved to be more of a challenge than anticipated by the report of the experts.

A worldwide network of seismic stations was built as a part of Vela Uniform, and for 40 years, this network has been the primary source of data for the seismic community. In 1961, the moratorium was broken when the Soviet Union resumed atmospheric testing. With the confidence gained through Vela in detecting and monitoring nuclear explosions, President Kennedy signed the Limited Test Ban Treaty in August 1963, which banned nuclear weapon testing in the atmosphere, underwater, and in space.

Nuclear explosion monitoring remains an important research activity at the Laboratory. Current efforts entail developing databases, methodologies, algorithms, software, and hardware to improve monitoring capabilities around the world. Technical support of arms control negotiations has also continued to be an integral part of Livermore's overall mission. Today, experts at the Laboratory provide technical assistance to the Department of Energy and National Nuclear Security Administration on treaty verification, and they analyze the effects of arms control measures on the weapons program and on the nation's nuclear deterrent.

Michael May comments at one of a series of workshops held in 2001 on the future of deterrence. The meetings were sponsored by Livermore's Center for Global Security Research, which focuses its activities on the nexus between technology and national security policy.

1959 E. O. LAWRENCE AWARDS CREATED


John S. Foster, Jr.
1960
Weapons


Herbert F. York
1962
Reactors


John H. Nuckolls
1969
Weapons


Michael M. May
1970
Weapons


Thomas E. Wainwright
1973
Weapons


Seymour Sack
1973
Weapons


Charles A. McDonald
1974
Weapons

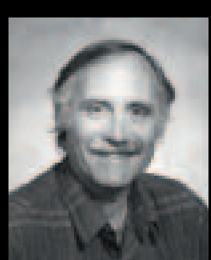

William Lokke
1975
Weapons


John L. Emmett
1977
National Security


B. Grant Logan
1980
Physics


Lowell L. Wood
1981
National Security


George F. Chapline
1982
National Security


George B. Zimmerman
1983
National Security


Robert B. Laughlin
1984
Physics


Peter L. Hagelstein
1984
National Security


Thomas A. Weaver
1985
National Security


Joe W. Gray
1986
Life Sciences


Wayne J. Shotts
1990
National Security


Richard Fortner
1991
National Security


John D. Lindl
1994
National Security


E. Michael Campbell
1994
National Security


Charles R. Alcock
1996
Physics

Exceptional Contributions to Nuclear Energy

Established in November 1959, the Ernest Orlando Lawrence Memorial Award is presented each year to scientists and engineers for their exceptional contributions to the development, use, or control of nuclear energy. Nuclear energy is broadly defined to include the science and technology of nuclear, atomic, molecular, and particle interactions and their effects. Researchers at Livermore have won 22 of the over 200 awards presented to date. Today, the award consists of a medal and a $25,000 prize.

Lawrence was the father of "big science" and founder of the nuclear science laboratories (or "Rad Labs") at Berkeley and Livermore that were named for him. His invention of the cyclotron in the 1930s started nuclear science on a path that has led to inventions ranging from advanced accelerators for elementary particle physics and the atom bomb to cancer therapies.

After Lawrence's death in August 1958, John A. McCone, Chairman of the Atomic Energy Commission, wrote to President Eisenhower suggesting the establishment of a Memorial Award in Lawrence's name. President Eisenhower agreed, saying, "Such an award would seem to me to be most fitting, both as a recognition of what he has given to our country and to mankind and as a means of helping to carry forward his work through inspiring others to dedicate their lives and talents to scientific effort."